REMARKS

Claims 25-34 and 37-48 are currently pending in this application. Claims 1-24, 35 and 36 have been cancelled, without prejudice.

Claim 25 has been amended to clarify that the synthesis process for preparing etherified melamine resin condensates comprises two vaporization steps for concentrating the etherified melamine precondensate. In the first vaporization step, the concentration of the etherified melamine resin precondensate in alcoholic solution is increased in a first vaporization step until the solids content of the etherified melamine resin precondensate is from 65 to 85% by weight. In the second vaporization step, the concentration of the etherified melamine resin precondensate in alcoholic solution from the first vaporization step is increased from 95 to 99% by weight. This amendment is supported at page 4, line 34 – page 5, line 7 and in the Examples of the originally filed application, as well as in pending claim 37. No new matter has been added to the application by the foregoing amendment.

Applicants respectfully request consideration and entry of the amendment since it places the application in better form for allowance or appeal.

Claims 25-34, 37 and 39-48 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Borner et al. (WO 02/40564 (equivalent to U.S. 2004/0024131)) in combination with Adams (U.S. Patent No. 2,473,463).

Borner et al. allegedly teaches a direct synthesis process for preparing etherified melamine resin condensates wherein:

a) in the first step of the reaction, an etherified melamine resin precondensate is prepared in alcoholic solution (such as methanol) with formaldehyde at temperature 20-100°C;

b) in at least one vaporization step (see Example 1), the concentration of the etherified melamine resin precondensate in alcoholic solution is increased, using C_4-C_{18} alcohols (C_4 butanol, see Example 1); and

c) in a second step of the reaction, the increased-concentration melamine resin precondensate is reacted, using a mixer (extruder, see Example 1).

With respect to claim 26, Borner et al. allegedly teaches that after the second step of the reaction, the etherified melamine resin condensate is discharged and pelletized

(granulated) (see Example 2).

With respect to claims 29-30, Borner et al. allegedly teaches a process which takes place at a pH of 6.5-9, preferably 7-8 (see line 0030).

With respect to claims 41-42, Borner et al. allegedly teaches using a highly vented extruder (see claim 9). Although Borner et al. does not teach the details of the extruder, allegedly it would have been obvious to a person of ordinary skill in the art that the process should have a very effective vapor removal system, since harmful formaldehyde releases during the process. Also, it was noted that at paragraph [0026], Borner et al. teaches that the precuring step can take place in equipment having a high mixing intensity and/or high evaporation capacity.

With respect to claim 43, Borner et al. allegedly teaches addition of up to 60% of particulate additives (see line 0040).

The Office Action acknowledges that Borner et al. does not teach a molecular weight of 500 to 50,000. However, the Office Action notes that the resulting resin is pelletized, which suggests that its molecular weight is at least 500.

Further, the Office Action acknowledges that Borner et al. does not disclose any exact solid content after vaporization. However, the Office Action contends that it would have been obvious to a person of ordinary skill in the art to obtain 95-99% solids in Borner et al.'s process in order to make the extrusion procedure more effective. In addition, a low amount of aggressive volatiles does not create any safety, corrosion and health issues during the above step of the process.

The Office Action notes that Borner et al. teaches addition of butanol after the neutralization step, which allegedly makes a trans-esterification process improbable. Therefore, the Examiner contends, the polymer of Borner et al. is not free from -NH-CH2-O-CH2-NH-, since methylol groups tend to react with each other.

The Office Action provided the following comments regarding the arguments submitted in the prior Amendment. The Office Action notes that Applicants argued that the Borner et al. reference teaches salt formation, contrary to the Application examined. The Office Action argues that in the first step of etherification the solutions of both Borner et al. and the present application are etherified, since acid catalyzed esterification (see Example 1

of Borner et al. and claims 30 and 32 of the Application) is specified. In addition, the Office Action notes, the neutralization step of Borner et al. is not excluded by claim 25 as it is written.

The Office Action contends that Adams teaches a process for making a fully methylated melamine-formaldehyde composition, which is obtained by trans-etherification with butanol (see Examples, particularly Example 3), where the first step represents methylolation with a subsequent etherification. The Office Action alleges that the above process is well known in the industry and it prevents additional polymerization of formaldehyde to paraformaldehyde. Adams allegedly teaches an etherification process at pH 5.5-6.5 (see column 4, line 65, meeting the limitations of claims 30 and 31) at 86-91°C (see column 6, line 15, meeting the limitations of claim 34) and a melamine-formaldehyde ratio of 1:3 (see Example 3, meeting the limitation of claim 35). Adams allegedly teaches both simultaneous and sequential processes (see Examples).

With respect to claim 33, Adams allegedly discloses a process at the presence of ion exchange resins (see Example 3). With respect to claim 36, Adams allegedly teaches that increased concentration of the condensate after vaporization is 10-85%. With respect to claim 37, Adams allegedly teaches two step distillations (see Examples). With respect to claim 40, Adams allegedly teaches addition of acid-modified butanol (see Examples).

The Office Action contends that it would have been obvious to a person of ordinary skill in the art to modify Borner et al.'s process with the process of Adams, since it will lead to a safer process (since no poisonous gas releases during the extrusion) and create a product with better mechanical properties (i.e., elasticity). In addition, Adams' process prevents forming a by-product (polyparaformaldehyde), which can deteriorate the performance of the target composition.

Regarding Adams, the Office Action notes that, in the prior amendment, Applicants argued that complete trans-etherification is not achievable by the Adams reference. The Office Action contends that this conclusion is incorrect. In claim 1, Adams claims "substantially complete replacement of the methyl groups of the methylated melamine-formaldehyde reaction product with primary butyl groups". Therefore, the Office Action argues, trans-etherification is completed due to the high excess of butanol in the

mixture. Further, the Office Action notes that Adams is used as a secondary reference to cure the deficiencies of Borner et al.'s process and as such the teaching of Adams about a liquid product is not limiting. Borner et al. teaches a distillation step with following granulation and extrusion.

Applicants respectfully, but strenuously, traverse this rejection and request that the rejection be reconsidered and withdrawn.

As reiterated by the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___, 82 U.S.P.Q.2d 1385 (2007), the framework for the objective analysis for determining obviousness under 35 U.S.C. §103 is stated in *Graham v. John Deere*. Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg., No. 195 (October 10, 2007) at page 57527 (hereinafter "Examination Guidelines"). The factual inquiries enunciated by the Court are as follows:

(1) Determining the scope and content of the prior art;

(2) Ascertaining the differences between the claimed invention and the prior art; and

(3) Resolving the level of ordinary skill in the pertinent art.

Examination Guidelines at page 57527.

"The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence." Manual of Patent Examining Procedure, (Sept. 2007) §716.01(d) and In re Oetiker, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992).

Borner et al. describes the synthesis and processing of 2,4-diamino-1,3,5-triazine aldehyde resins. Substituted 2,4-diamino-1,3,5-triazines are reacted with an aldehyde, such as formaldehyde, to form unetherified aldehyde-triazine resins in a basic environment.

In a second step the unetherified resin is then etherified with a C_1-C_{12} alcohol under acidic conditions. Such obtained resins are only partially etherified and still contain -NH-CH_2-O-CH_2-NH- groups, as acknowledged in the Office Action at page 4, lines 3-5. The excess alcohol is removed by distillation, thus increasing the concentration of the etherified

resin (Example 1).

Following the etherification, the etherified amino resins are precured at temperatures between 160 to 200°C. Only after the precuring process at 160-200°C are the -NH-CH_2-O-CH_2-NH- groups removed, although not completely (see [0028] of Borner et al.).

Thus, Borner et al. does not teach a) a transetherification process and b) a two step vaporization process for concentrating the etherified melamine resin precondensate up to a concentration of 99 wt%, as presently claimed.

In contrast to the teachings of Borner et al., amended claim 25 of the present claims relates to a process that in a first step reacts melamine and formaldehyde in an alcoholic solution to form an etherified melamine precondensate. In the following first vaporization step, the etherified melamine precondensate is then concentrated up to 85 wt%. In a second vaporization step, a further concentration up to 99 wt% of the precondensate is carried out. An alcohol is added to the etherified melamine precondensate prior, during or after these two vaporization steps. Thus, the transetherification is conducted with the highly concentrated precondensate.

By the process of present claim 25, a resin is obtained which is free of -NH-CH_2-O-CH_2-NH- groups. Due to the re-etherification of the resin with a high molecular weight alcohol, all of the -NH-CH_2-O-CH_2-NH- groups are eliminated.

Thus, the present invention is not obvious over the teachings of Borner et al.

The teachings of Adams do not cure the deficiencies of the teachings of Borner et al.

Adams teaches a process for preparing liquid alkylated melamine-formaldehyde compositions. Methanol, melamine, formaldehyde are reacted in a first step and the obtained condensate is transetherified with propanol or butanol in a second step (column 1, lines 10-30, example 3-5 of Adams).

It is crucial that no gel formation or precipitation occurs during the reaction (column 4, lines 17-28 of Adams) since the formed condensate is intended to be used further as a liquid composition (column 6, lines 4-7 of Adams).

In order to avoid gel formation or precipitation, the reaction of melamine, formaldehyde and methanol is carried out in a distillation process whereby methanol and/or butanol are added at the same rate as the volatile compounds methanol and/or butanol and water are removed from the reaction mixture (example 3, column 7, lines 7-15 of Adams). In this way, the volume of the reaction mass was maintained approximately constant (example 5, column 7, lines 56-62). This ensures a constant concentration of the reactants in the reaction mixture. In this manner, an enrichment or concentration of the precondensate is avoided according to Adams.

Only after the final product is obtained in the form of a liquid composition or varnish might the product be concentrated or diluted to yield products comprising 10-85 wt% of resin (column 5, lines 1- 5, examples 3 and 5).

Taken together, Adams discloses a process for synthesizing an etherified melamine-formaldehyde composition comprising the steps of:

a) Reacting melamine and formaldehyde in methanolic solution ensuring a constant volume of the reaction mixture;

b) Adding butanol to the reaction mixture of melamine, formaldehyde and methanol ensuring a constant volume of the reaction mixture;

c) Concentrating the liquid composition up to a concentration of 85 wt%.

On the other hand, present claim 25 relates to a process for preparing an etherified melamine resin condensate comprising the steps of:

a) Reacting melamine and formaldehyde in alcoholic solution;

b) Concentrating the etherified melamine precondensate up to 85 wt% by a first vaporization;

c) Concentrating the etherified melamine precondensate up to 99 wt% by a second vaporization; and

d) Transetherifying the concentrated precondensate in a mixer.

Thus, Adams does not disclose a two step vaporization process for obtaining an etherified melamine precondensate with a concentration of up to 99 wt% according to claim 25, and does not cure the deficiency of the teachings of Borner et al.

Also, Adams does not disclose the step of transetherification using a melamine precondensate with a concentration of up to 99 wt%.

According to Adams, the methylated melamine-formaldehyde composition is transetherified with butanol in solution since it is imperative that no gel formation and precipitation of the composition occurs (see examples 3 and 5). Studying Adams, a person skilled in the art would come to the conclusion that a transetherification reaction can solely be carried out in a liquid environment.

Thus, a person skilled in the art would not even consider carrying out a transetherfication process with a highly concentrated melamine-formaldehyde condensate.

According to the present invention, however, the enrichment of the precondensate to a concentration of about 95 to 99 % by weight before transetherification is crucial for solving the object of the invention that is the synthesis of a resin completely free of formaldehyde forming groups.

Only melamine-formaldehyde precondensates in such a high concentration obtainable in the two step vaporization process guarantee that the water is completely removed from the resin and thus a complete transetherification takes place. By complete removal of water no hydrolytic reaction and concomitant formaldehyde formation can occur.

Melamine-formaldehyde resins with a concentration of up to 85 wt% as described by Adams, on the other hand, still contain plenty of water which in turn promotes the reverse reaction of formaldehyde with the precondensate.

The enrichment is also absolutely necessary for the reaction of the increased-concentration melamine resin precondensate in a mixer, such as a kneader. For a reaction in a mixer, especially in a kneader, it is advantageous if the mixture is present in form of a highly viscous mass and not in form of a liquid as in Adams.

Thus, the present invention is also not obvious over the teaching by Adams.

Also a combination of the teachings by Borner et al. and Adams would not render the present invention obvious.

A combination would lead at the most to a process comprising the steps of:

a) Reacting melamine with aldehydes;

b) Etherification of the melamine-aldehyde condensate with an alcohol;

c) opt. concentrating the reaction mixture (Borner et al.);

d) Adding butanol to the reaction mixture of melamine, formaldehyde and alcohol ensuring a constant volume of the reaction mixture (Adams); and

e) Concentrating the obtained liquid composition up to a concentration of 85 wt% (Adams).

Such a hypothetical process does not comprise a two-step vaporization process providing a melamine precondensate in a concentration up to 99%, as in present claim 25. Also, such a process would not provide a completely transetherified resin which is free of $-NH-CH_2-O-CH_2-NH-$groups, as in present claim 25.

Accordingly, Applicants contend that a *prima facie* case of obviousness has not been established. Thus, Applicants request reconsideration and withdrawal of the §103(a) rejection of claims 25-34, 37 and 39-48 over Borner et al. in combination with Adams.

Claim 38 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Borner et al. in combination with Adams and Horacek (U.S. Patent No. 5,206,066).

The Office Action acknowledges that Borner et al. and Adams does not teach a diol as an etherification agent. The Office Action cites Horacek as disclosing a melamine-formaldehyde resin, modified with diol (see Abstract and column 2, line 30), such as 1,4-butanediol. The alleged advantage of the Horacek resin is that it exhibits low shrinkage during curing and good mechanical properties (high flexibility) (see column 1, line 30). Therefore, the Office Action contends, it would have been obvious to a person of ordinary skill in the art to use diols in Borner et al./Adams processes to achieve low shrinkage during curing and high flexibility.

Regarding Horacek, the Office Action notes that Applicants argued in the prior amendment that Horacek uses very strong toluene sulfonic acid, which leads to uncontrollable molecular weight. The Office Action contends that this is incorrect. First, the Office Action points out that the amount of the acid is very low (0.1-1%) (see column 3, line 10). Second, the Office Action notes that Horacek does not exclude another acidic catalyst, stating that "usual catalysts can be added".

The Office Action also notes that Applicants have argued that Horacek uses melamine to formaldehyde ratio of 1 to (5-6), whereas Applicants use a ratio of 1 to (2-4). However, the Office Action cites Horacek as secondary reference to modify Borner et al. to provide low shrinkage during curing and good mechanical properties (high flexibility), noting that the primary reference teaches a 1:2 ratio that meets the limitations of claim 25.

Applicants respectfully, but strenuously, traverse this rejection and request that the rejection be reconsidered and withdrawn.

As described above, the combined teachings of Borner et al. and Adams do not render the presently claimed process obvious.

Horacek teaches melamine resins obtained in a process of mixing etherified melamine-formaldehyde resins having a melamine/formaldehyde ratio of 1:(5-6) with diols until a certain viscosity is reached (see Example 1). The resin is thus characterized by a high formaldehyde content. In contrast to Horacek, the present process uses a lower melamine/formaldehyde ratio of 1:2 to 1:4.

The process of Horacek also does not include a vaporization step and concentration of the melamine formaldehyde resin.

Thus, the present invention is also not obvious over the teachings of Horacek.

A combination of the teachings of Borner et al., Adams and Horacek would lead at the most to a process comprising the synthesis of an etherified resin, opt. concentrating of the etherified resin (Borner et al.) followed by a transetherification with diols in the presence of a strong acid (Horacek).

Such a combination, however, would not provide a process comprising two vaporization steps in order to obtain a precondensate of up to 99 wt% and a transetherification of said highly concentrated precondensate.

Taken together, amended claim 25 is not obvious over the cited combination of the teachings of Borner et al., Adams and Horacek.

CONCLUSION

In view of the arguments and amendments made to claim 25, it is respectfully requested that this Amendment be entered. Also, reconsideration and withdrawal of the rejections and allowance of the pending claims is respectfully requested.

Should the Examiner have any questions of any nature regarding this Amendment, he is invited to contact Applicants' undersigned representative by telephone.

Respectfully submitted,

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